Ion Control System (ICS) Characterization

Completed Technology Project (2017 - 2020)

Project Introduction

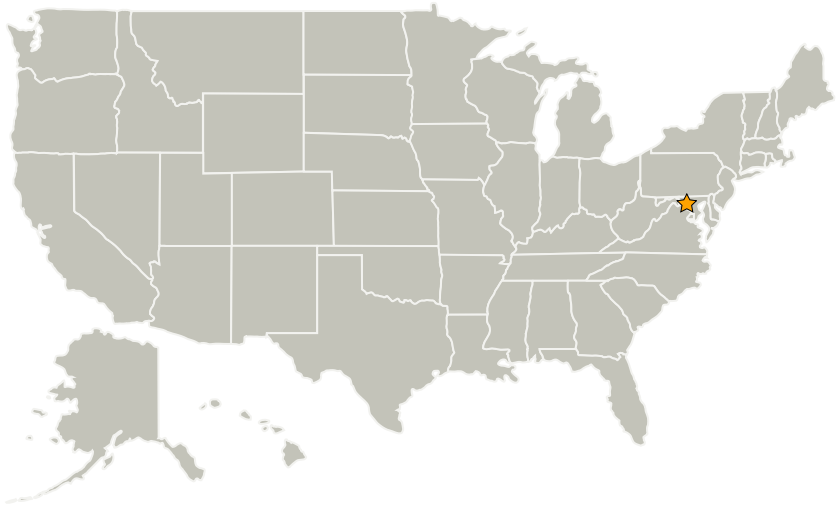
The Ion Control System (ICS) is a high specific impulse (Isp), low-thrust electric propulsion that is suitable for small satellite attitude control, precision orbit control, constellation formation management, and extended low-thrust maneuvers.

Anticipated Benefits

The ICS is an Electric Propulsion (EP) micro-propulsion system providing low cost, high performance (ISP and thrust precision), reliability, easy configurability and scalability for SmallSat/CubeSat. Specific benefits include:

- Low exhaust plume contamination risk
- Large input voltage range
- No high-voltage input needed
- Low power consumption
- Secondary payload compatible (inert propellant, no pressure vessels)
- Flexible impulse control
- Scalable

Primary U.S. Work Locations and Key Partners



Thruster for the Ion Control System

Table of Contents

Center Independent Research & Development: GSFC IRAD

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Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland

Project Transitions

October 2017: Project Start

September 2020: Closed out

Closeout Summary: The Ion Control System (ICS) is a high specific impulse (I sp), low-thrust electric propulsion that is suitable for small satellite attitude cont rol, precision orbit control, constellation formation management, and extended l ow-thrust maneuvers. The objective of this effort is to develop a reliable micro-p ropulsion guidance, navigation, and control (GN&C) actuator/system that will be used as a component in Goddard science-class SmallSats. The specific goal to e nhance efficiency and to assemble a protoflight unit ready for a TRL6 Flight oppo rtunity was met. The unit is being integrated into petitSat, a 6U CubeSat, as a t echnology demonstration and is scheduled for launch Q4 2021. The purpose of t he Goddard Space Flight Center's Internal Research and Development (IRAD) pr ogram is to support new technology development and to address scientific challe nges. Each year, Principal Investigators (PIs) submit IRAD proposals and comp ete for funding for their development projects. Goddard's IRAD program suppor ts eight Lines of Business: Astrophysics; Communications and Navigation; Cross -Cutting Technology and Capabilities; Earth Science; Heliophysics; Planetary Sci ence; Science Small Satellites Technology; and Suborbital Platforms and Range Services. Task progress is evaluated twice a year at the Mid-term IRAD review a nd the end of the year. When the funding period has ended, the PIs compete ag ain for IRAD funding or seek new sources of development and research funding, or agree to external partnerships and collaborations. In some cases, when the d evelopment work has reached the appropriate Technology Readiness Level (TRL) level, the product is integrated into an actual NASA mission or used to support o ther government agencies. The technology may also be licensed out to the indus try. The completion of a project does not necessarily indicate that the developm ent work has stopped. The work could potentially continue in the future as a foll ow-on IRAD; or be used in collaboration or partnership with Academia, Industry, and other Government Agencies. If you are interested in partnering with NASA, see the TechPort Partnerships documentation available on the TechPort Help ta b. http://techport.nasa.gov/help

Organizational Responsibility

Responsible Mission Directorate:

Mission Support Directorate (MSD)

Lead Center / Facility:

Goddard Space Flight Center (GSFC)

Responsible Program:

Center Independent Research & Development: GSFC IRAD

Project Management

Program Manager:

Peter M Hughes

Project Managers:

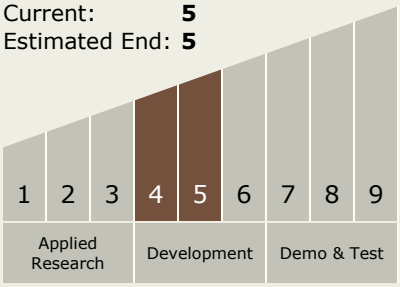
Jason W Mitchell
Michael A Johnson

Principal Investigator:

Robert W Moss

Technology Maturity (TRL)

Start: **4**
Current: **5**
Estimated End: **5**



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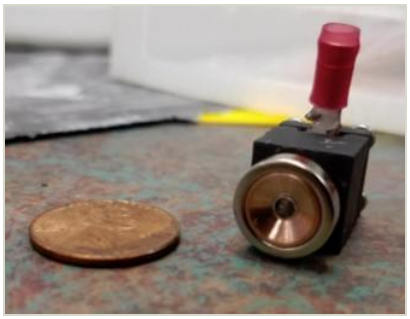
Images



Thruster for the Ion Control System
Thruster for the Ion Control System *(https://techport.nasa.gov/image/39105)*

Links

NASA Goddard Website *(http://www.nasa.gov/centers/goddard/home/index.html)*

NASA Wallops Facebook *(https://www.facebook.com/NASAWFF)*

NASA Wallops Twitter *(https://twitter.com/nasa_wallops)*

Project Website:

https://etd.gsfc.nasa.gov/

Technology Areas

Primary:

- TX01 Propulsion Systems
  - TX01.2 Electric Space Propulsion
    - TX01.2.3 Electromagnetic

Target Destination

Earth